Impact of three lateral root types identified in pearl millet on water uptake

S. Passot, F. Meunier, Bertrand Muller, M. Javaux, X. Draye, Yann Guédon, Laurent Laplaze

IDT3-012 | Impact of three lateral root types identified in pearl millet on water uptake

Passot S.[1]*, Meunier F.[1], Muller B.[2], Javaux M.[1], Draye X.[1], Guédon Y.[3], Laplaze L.[4,5]

[1]Earth and Life Institute - Agronomy, UCL, Louvain-la-Neuve, Belgium
[2]LEPSE, INRA, Montpellier, France
[3]AGAP, Cirad, Montpellier, France
[4]DIADE, IRD, Montpellier, France
[5]LMI LAPSE, IRD, Dakar, Senegal
*E-mail: sixtine.passot@uclouvain.be

Pearl millet plays an important role for food security in arid regions. Improving its root system toward increased water uptake efficiency could improve pearl millet tolerance to drought and lead to a significant production rise under water-limiting conditions. The objective of this work was to provide an integrated description of root system development at early stages and to assess the consequences of these findings for water uptake. A precise description of pearl millet root system development evidenced large variability among lateral root growth profiles. To further analyze this diversity, the growth rates of many lateral roots were measured daily and a statistical model was designed to classify these roots on the basis of their growth profiles. Three categories of lateral roots were identified in this way: (i) roots with high growth rate that could keep on growing after the end of the experiment, (ii) roots with intermediate growth rates and (iii) roots with low growth rates that quickly stop growing. The different lateral root types were randomly distributed along the primary root and there was no influence of root types on the intervals between successive lateral roots. The proportions of these different types were variable between plants of the same genotype, suggesting that small environmental variations could control these proportions. Water movements between soil and roots is modeled with R-SWMS to assess (i) the benefits of the three-type structuring, (ii) the relative contribution of each type to water uptake and (iii) the impact of specific proportions on global water uptake.

IDT3-013 | Temperature induction response (TIR): A novel physiological approach for thermotolerant genotypes in chickpea (*Cicer arietinum* L.)

Raghavendra T*[1], Jayalakshmi V[1], Gopal Reddy B[1]

[1]Regional Agricultural Research Station, Nandyal-518501
Acharya NG Ranga Agricultural University, Andhra Pradesh, India.
*E-mail: Raghavendraagrico@gmail.com

Chickpea (*Cicer arietinum* L.) is an important food legume cultivated in arid and semi-arid regions of the world. Drought coupled with moisture stress and high temperature may impose several adverse affects on its growth and development. It is known that chickpea thrives well under drought-prone conditions. However, heat stress during reproductive development can cause significant yield loss and there is a greater variability for yield performance of chickpea genotypes under heat stress. It is extremely important to develop screening tools for identification of thermotolerant chickpea genotypes in view of the increase in average global temperatures. In this context, a lab experiment was conducted during *kharif* 2015-16 at RARS Nandyal to standardize the temperature induction response (TIR) protocol for chickpea seedlings using WGC-450 Programmable Plant Growth Chamber. Temperatures were standardized as sub lethal i.e. challenging temperatures as 38-500C (for 4 hours and 30 min) and lethal temperatures as 500C (for 2 hours). This technique can be used as a potential tool to identify and select temperature tolerant lines at the seedling stage from a large population. A set of diverse chickpea germplasm comprising of 57 genotypes were screened for intrinsic tolerance using the standardized Thermo Induced Response (TIR) protocol. Among the genotypes NBeG-528,NBeG-458,NBeG-511,NBeG-177,NBeG-747,NBeG-732 and VIHAR showed highest thermo tolerance in terms of higher seedling survival with no reduction in root and shoot growth. The genotypes with intrinsic heat tolerance can be explored for the development of varieties suitable for late sown conditions in Andhra Pradesh where chickpea is prone to terminal heat stress.